CLAIMS

I claim:

1. A fuel cell assembly, comprising:

a fuel cell;

at least one electrical conductor; and

at least one liquid metal electrical interconnect that electrically connects the fuel cell to the at least one electrical conductor.

2. A fuel cell assembly as claimed in claim 1, further comprising:

a housing defining an interior and an exterior;

wherein the at least one electrical conductor extends from the interior of the housing to the exterior of the housing.

3. A fuel cell assembly as claimed in claim 1, wherein

the fuel cell comprises an anode and a cathode;

the at least one electrical conductor comprises a positive electrical conductor and a negative electrical conductor; and

the at least one liquid metal electrical interconnect comprises a first liquid metal electrical interconnect that electrically connects the anode to the negative electrical conductor and a second liquid metal electrical interconnect that electrically connects the cathode to the positive electrical conductor.

4. A fuel cell assembly as claimed in claim 1, wherein the fuel cell comprises a solid oxide fuel cell.

5. A fuel cell assembly as claimed in claim 1, wherein the fuel cell comprises a substantially tubular fuel cell.

6. A fuel cell assembly as claimed in claim 1, wherein the liquid metal electrical interconnect comprises a material having a boiling point of at least about 1500°C.

7. A fuel cell assembly as claimed in claim 1, wherein

the fuel cell has an operating temperature; and

the liquid metal electrical interconnect comprises a material having a boiling point that is greater than the operating temperature of the fuel cell.

8. A fuel cell assembly as claimed in claim 1, wherein the liquid metal electrical interconnect comprises a material having a melting point of not more than about 100°C.

9. A fuel cell assembly as claimed in claim 1, wherein the liquid metal electrical interconnect comprises an indium-gallium alloy.

10. A fuel cell assembly as claimed in claim 9, wherein indium-gallium alloy comprises about 24.5% indium and about 75.5% gallium.

11. A fuel cell assembly, comprising:

a housing assembly including a plurality of housing components;

a fuel cell located within the housing assembly; and

a liquid metal seal between at least two of the housing components.

12. A fuel cell assembly as claimed in claim 11, wherein

the housing components include at least one reactant tube and an enclosure defining at least one reactant aperture with an aperture surface;

at least a portion of the at least one reactant tube is located within the reactant aperture; and

the liquid metal seal is located between the portion of the at least one reactant tube and the aperture surface.

13. A fuel cell assembly as claimed in claim 12, wherein

the enclosure defines a first and second reactant apertures with respective aperture surfaces;

the at least one reactant tube comprises a reactant inlet tube and a reactant outlet tube;

at least a portion of the reactant inlet tube is located within the first reactant aperture and at least a portion of the reactant outlet tube is located within the second reactant aperture; and

the liquid metal seal comprises first and second liquid metal seals respectively located between the portion of the reactant inlet tube and the aperture surface of the first reactant aperture and the the portion of the reactant outlet tube and the aperture surface of the second reactant aperture.

14. A fuel cell assembly as claimed in claim 11, wherein

the housing components comprise a first and second enclosure members that together enclose the fuel cell; and

the liquid metal seal is located between the first and second enclosure members.

15. A fuel cell assembly as claimed in claim 11, wherein the fuel cell comprises a solid oxide fuel cell.

16. A fuel cell assembly as claimed in claim 11, wherein the fuel cell comprises a substantially tubular fuel cell.

17. A fuel cell assembly as claimed in claim 11, wherein the liquid metal seal comprises a material having a boiling point of at least about 1500°C.

18. A fuel cell assembly as claimed in claim 11, wherein

the fuel cell has an operating temperature; and

the liquid metal seal comprises a material having a boiling point that is greater than the operating temperature of the fuel cell.

19. A fuel cell assembly as claimed in claim 11, wherein the liquid metal seal comprises a material having a melting point of not more than about 100°C.

20. A fuel cell assembly as claimed in claim 11, wherein the liquid metal seal comprises an indium-gallium alloy.

21. A fuel cell assembly as claimed in claim 20, wherein indium-gallium alloy comprises about 24.5% indium and about 75.5% gallium.

22. A fuel cell assembly, comprising:

a housing assembly including a plurality of housing components and at least one reactant chamber;

a fuel cell located within the housing assembly; and

at least one liquid metal electrical interconnect/seal that electrically connects the fuel cell to one of the housing components and forms a seal between the at least one reactant chamber and one of the housing components.

23. A fuel cell assembly as claimed in claim 22, wherein the at least one liquid metal electrical interconnect/seal electrically connects the fuel cell to, and forms a seal between the at least one reactant chamber and, the same housing component.

24. A fuel cell assembly as claimed in claim 22, wherein

the housing assembly includes a reactant tube operably connected to the at least one reactant chamber; and

the at least one liquid metal electrical interconnect/seal electrically connects the fuel cell to, and forms a seal between the at least one reactant chamber and, the reactant tube.

25. A fuel cell assembly as claimed in claim 24, wherein the fuel cell comprises a substantially tubular fuel cell.

26. A fuel cell assembly as claimed in claim 22, wherein the fuel cell comprises a solid oxide fuel cell.

27. A fuel cell assembly as claimed in claim 22, wherein the liquid metal electrical interconnect/seal comprises a material having a boiling point of at least about 1500°C.

28. A fuel cell assembly as claimed in claim 22, wherein

the fuel cell has an operating temperature; and

the liquid metal electrical interconnect/seal comprises a material having a boiling point that is greater than the operating temperature of the fuel cell.

29. A fuel cell assembly as claimed in claim 22, wherein the liquid metal electrical interconnect/seal comprises a material having a melting point of not more than about 100°C.

30. A fuel cell assembly as claimed in claim 22, wherein the liquid metal electrical interconnect/seal comprises an indium-gallium alloy.

31. A fuel cell assembly as claimed in claim 30, wherein indium-gallium alloy comprises about 24.5% indium and about 75.5% gallium.

32. A fuel cell system, comprising:

a reactant supply; and

a fuel cell assembly including

a fuel cell operably connected to the reactant supply;

at least one electrical conductor, and

at least one liquid metal electrical interconnect that electrically connects the fuel cell to the at least one electrical conductor.

33. A fuel cell system as claimed in claim 32, wherein the reactant supply comprises a fuel supply.

34. A fuel cell system as claimed in claim 32, wherein

the fuel cell comprises an anode and a cathode;

the at least one electrical conductor comprises a positive electrical conductor and a negative electrical conductor; and

the at least one liquid metal electrical interconnect comprises a first liquid metal electrical interconnect that electrically connects the anode to the negative electrical conductor and a second liquid metal electrical interconnect that electrically connects the cathode to the positive electrical conductor.

35. A fuel cell system as claimed in claim 32, wherein the fuel cell comprises a solid oxide fuel cell.

36. A fuel cell system as claimed in claim 32, wherein

the fuel cell has an operating temperature; and

the liquid metal electrical interconnect comprises a material having a boiling point that is greater than the operating temperature of the fuel cell.

37. A fuel cell system as claimed in claim 32, wherein the liquid metal electrical interconnect comprises a material having a melting point of not more than about 100°C.

38. A fuel cell system, comprising:

a reactant supply; and

a fuel cell assembly including

a housing assembly including a plurality of housing components,

a fuel cell, operably connected to the reactant supply, located within the housing assembly, and

a liquid metal seal between at least two of the housing components.

39. A fuel cell system as claimed in claim 38, wherein the reactant supply comprises a fuel supply.

40. A fuel cell system as claimed in claim 38, wherein

the housing components include at least one reactant tube and an enclosure defining at least one reactant aperture with an aperture surface;

at least a portion of the at least one reactant tube is located within the reactant aperture; and

the liquid metal seal is located between the portion of the at least one reactant tube and the aperture surface.

41. A fuel cell system as claimed in claim 38, wherein the fuel cell comprises a solid oxide fuel cell.

42. A fuel cell system as claimed in claim 38, wherein

the fuel cell has an operating temperature; and

the liquid metal seal comprises a material having a boiling point that is greater than the operating temperature of the fuel cell.

43. A fuel cell system as claimed in claim 38, wherein the liquid metal seal comprises a material having a melting point of not more than about 100°C.

44. A fuel cell system, comprising:

a reactant supply; and

a fuel cell assembly including

a housing assembly including a plurality of housing components and at least one reactant chamber operably connected to the reactant supply;

a fuel cell located within the housing assembly, and

at least one liquid metal electrical interconnect/seal that electrically connects the fuel cell to one of the housing components and forms a seal between the at least one reactant chamber and one of the housing components.

45. A fuel cell system as claimed in claim 44, wherein the at least one liquid metal electrical interconnect/seal electrically connects the fuel cell to, and forms a seal between the at least one reactant chamber and, the same housing component.

46. A fuel cell system as claimed in claim 44, wherein

the housing assembly includes a reactant tube operably connected to the at least one reactant chamber; and

the at least one liquid metal electrical interconnect/seal electrically connects the fuel cell to, and forms a seal between the at least one reactant chamber and, the reactant tube.

47. A fuel cell system as claimed in claim 44, wherein the fuel cell comprises a solid oxide fuel cell.

48. A fuel cell system as claimed in claim 44, wherein

the fuel cell has an operating temperature; and

the liquid metal electrical interconnect/seal comprises a material having a boiling point that is greater than the operating temperature of the fuel cell.

49. A fuel cell system as claimed in claim 48, wherein the liquid metal electrical interconnect/seal comprises a material having a melting point of not more than about 100°C.

50. A method of making a fuel cell assembly, comprising the step of:

forming a liquid metal electrical interconnect between a fuel cell and at least one electrical conductor.

51. A method of making a fuel cell assembly as claimed in claim 50, wherein the step of forming a liquid metal electrical interconnect comprises forming a liquid metal electrical interconnect between a fuel cell and at least one electrical conductor with a material having a boiling point of at least about 1500°C.

52. A method of making a fuel cell assembly as claimed in claim 50, wherein the fuel cell has an operating temperature and the step of forming a liquid metal electrical interconnect comprises forming a liquid metal electrical interconnect between a fuel cell and at least one electrical conductor with a material having a boiling point that is greater than the operating temperature of the fuel cell.

53. A method of making a fuel cell assembly as claimed in claim 50, wherein the step of forming a liquid metal electrical interconnect comprises forming a liquid metal electrical interconnect between a fuel cell and at least one electrical conductor with a material having a melting point of not more than about 100°C.

54. A method of making a fuel cell assembly, comprising the step of:

forming a liquid metal seal between at least two fuel cell housing components.

55. A method of making a fuel cell assembly as claimed in claim 54, wherein the step of forming a liquid metal seal comprises forming a liquid metal seal between a reactant tube and a housing component.

56. A method of making a fuel cell assembly as claimed in claim 54, wherein the step of forming a liquid metal seal comprises forming a liquid metal seal between a reactant tube and a fuel cell support structure.

57. A method of making a fuel cell assembly as claimed in claim 54, wherein the step of forming a liquid metal seal comprises forming a liquid metal seal between at least two fuel cell housing components with a material having a boiling point of at least about 1500°C.

58. A method of making a fuel cell assembly as claimed in claim 54, wherein the step of forming a liquid metal seal comprises forming a liquid metal seal between at least two fuel cell housing components with a material having a melting point of not more than about 100°C.

59. A method of making a fuel cell assembly, comprising the step of:

forming a liquid metal electrical interconnect/seal that electrically connects a fuel cell to a housing component and forms a seal between at least one reactant chamber and a housing component.

60. A method of making a fuel cell assembly as claimed in claim 59, wherein the step of forming a liquid metal electrical interconnect/seal comprises forming a liquid metal electrical interconnect/seal that electrically connects a fuel cell to, and forms a seal between a reactant chamber and, the same housing component.

61. A method of making a fuel cell assembly as claimed in claim 59, wherein the step of forming a liquid metal electrical interconnect/seal comprises forming a liquid metal electrical interconnect/seal that electrically connects a fuel cell to a housing component and forms a seal between at least one reactant chamber and a housing component with a material having a boiling point of at least about 1500°C.

62. A method of making a fuel cell assembly as claimed in claim 59, wherein the fuel cell has an operating temperature and the step of forming a liquid metal electrical interconnect/seal comprises forming a liquid metal electrical interconnect/seal that electrically connects a fuel cell to a housing component

and forms a seal between at least one reactant chamber and a housing component with a material having a boiling point that is greater than the operating temperature of the fuel cell.

63. A method of making a fuel cell assembly as claimed in claim 59, wherein the step of forming a liquid metal electrical interconnect/seal comprises forming a liquid metal electrical interconnect/seal that electrically connects a fuel cell to a housing component and forms a seal between at least one reactant chamber and a housing component with a material having a melting point of not more than about 100°C.

64. A fuel cell assembly, comprising:

a housing assembly including a plurality of housing components;

a fuel cell located within the housing assembly; and

means for forming a seal in a capillary space between at least two of the housing components that will not be substantially stressed in response to the at least two housing components changing dimensions at different rates.

65. A fuel cell assembly, comprising:

a housing assembly including a plurality of housing components and at least one reactant chamber;

a fuel cell located within the housing assembly; and

means for electrically connecting the fuel cell to one of the housing components and forming a seal between the at least one reactant chamber and one of the housing components that will not be substantially stressed in response to the at least one reactant chamber and the one of the housing components changing dimensions at different rates.